A PECULIAR CONDITION OF ŒDOGONIUM.

BY IDA A. KELLER.

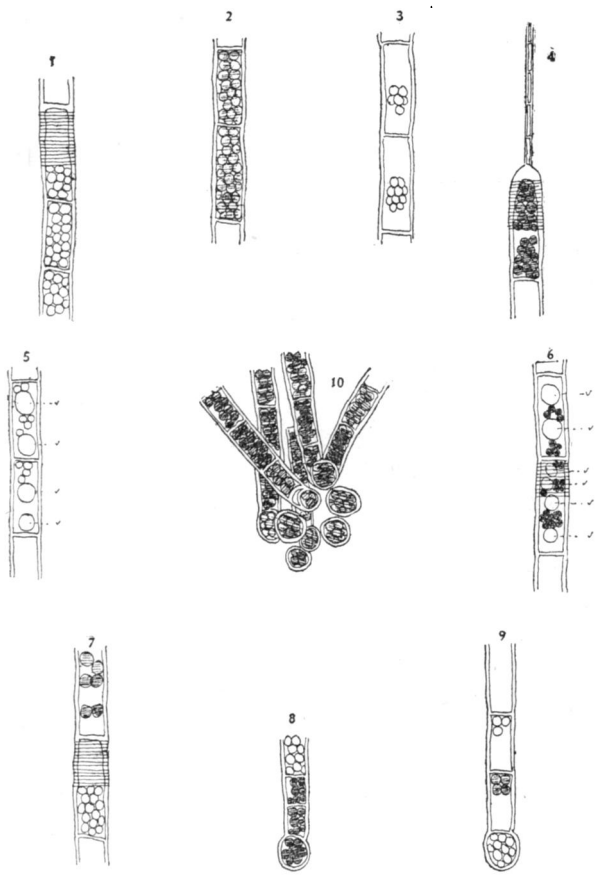
For several years I have kept a jar of water at my window, in which I have found interesting things at different times. Last fall there was a luxuriant growth of a dense green mat, which turned out to be a species of *Œdogonium*. Later on, as the color gradually disappeared, I took for granted that the plant was about to die, and gave it no further attention. The next time I happened to observe the jar the alga seemed to have been replaced by a heavy growth of the mycelium of some fungus. This remained in a thriving condition all winter, and proved on examination, to my great surprise, not to be a fungus at all, but the *Œdogonium* which had lost its chlorophyll. In all other respects the alga was apparently in a perfectly healthy condition, its filaments were rooted fast to pieces of rock which were in the bottom of the jar, the cells showed absolutely no signs of decomposition—furthermore, they were remarkably well packed with granules which turned out to be starch.

This phenomenon seemed to me an unusual one. I know of no alga which continues to live after it loses its chlorophyll, nor can I recall any parallel case among the higher plants—a water-plant which ceases its assimilating activity, full of the most attractive bait for bacteria, in nowise protected from them, and yet of sufficient vitality to withstand all attacks of these ever-present enemies.

The condition of the plant in May may be summed up as follows: The filaments are rooted to pieces of rock. To the naked eye they seem perfectly colorless and form a dense tuft of white threads. Fig. 1 represents a typical case. It shows absolutely no sign of chlorophyll and is full of starch.

In fig. 2 I have represented what may be regarded as a transition stage. It is also full of starch, but the cell has a faint greenish tinge. It is impossible to say whether the plant is just regaining its chlorophyll or whether it is just losing it.

The condition of a dead cell is represented in fig. 3. Here the protoplasm is contracted, and the starch granules are lumped together in the centre of the cells, in striking contrast to the case represented in fig. 1.



Microscopic examination further showed that green threads were interspersed here and there among these white filaments; one of these is shown in fig. 4, the green color being indicated by shading. I regret not having made the examination sooner, since it would then have been possible for me to say whether or not the green color is newly acquired. It seems quite probable that some of the

threads remained green over the winter, but, being few, they were not noticeable to the naked eye.

The quantity of starch in the bleached cells varied considerably. The extreme condition, on the one hand, where the cells were quite full of starch, as in fig. 1, is markedly different from the rather starved condition of figs. 5 and 6. In the latter cases the cells are doubtless still alive, but they contain comparatively little starch and great vacuoles. The vacuoles are well brought out on treating the cells with iodine (fig. 6).

The plant, as a whole, is certainly in a living and, I believe, actively growing condition, and it looks as though it were regaining its normal activity. Extremes and transitions, as regard the quantity of chlorophyll present, can easily be observed. Comparisons of figs. 1, 7, 9 and 2 will illustrate this point. Fig. 1 shows the perfectly bleached cell, figs. 7 and 9 show cells containing a little chlorophyll, while fig. 4 represents the deep green cell, which consists of one large mass of connected chromatophores. Furthermore, such cases as that of fig. 2, which I mentioned above, were to be found where the whole cell was colored, but the green tinge a very faint one.

The filaments come singly or in groups from basal cells (figs. 8, 9 and 10). In many cases these basal cells are green, while the remainder of the filament may be either green or bleached. Fig. 9 represents a case where the basal cell is white.

The normal state of affairs is the following: The vegetative condition finally results in the formation of oögonia. These are the only portions of the plant which survive the winter, and are protected from cold and moisture by their thick cell walls.[1] In this instance the oögonia were not formed, and the food which the plant had stored up for this normal function remained in the form of starch. Naturally it will be of interest to find out if the plant will again resume its assimilating activity. It would also be of interest to determine if the plant behave similarly out of doors, which it might well do under the conditions of a mild winter or in protected places. At all events, the fact that the plant continues to live in its present ghostlike condition seems an interesting revelation, so far as the physiology of algæ is concerned.

In Leunis' *Synopsis der Botanik*[2] I found the following state-

[1] Luerssen, *Grundzüge der Botanik*, p. 191.
[2] Leunis, *Synopsis der Botanik*, Bd. III, pp. 163, 164.

ment, which seems of interest in this connection. Of *Œdogonium capillare* this author says: "It is a form frequent in stagnant waters, and forms when the water disappears a felt-like mass, the so-called 'Meteor Papier' (Meteor Paper). Such masses are also found on meadows which have been submerged for some time, the so-called Wiesentuch, Wiesenleder (meadow cloth, meadow leather). The same formations have been repeatedly found on meadows along the River Oder after floods and are called Oder Haut (Oder skin). A piece which was examined in 1736 by Ehrenberg, and one observed by Cohen in 1849, consisted principally of *Cladophora fracta* and diatoms." In commenting on this phenomenon Leunis makes the following statement: "This comparatively rare formation is the result of a number of conditions—appearance of vigorous algoid growth, rapid evaporation of water in consequence of sunshine and high temperature, and a soil which does not long retain its moisture, so that the Confervæ are not decomposed."

The condition described by Leunis resembles the one I have just observed in the fact that in both cases the alga is bleached and not decomposed. It differs from it, however, in the fact that in drying all activity is forced to cease, while the plant under consideration continues its existence in its normal medium; and it is this, together with the fact that decomposition does not set in, which makes this condition of *Œdogonium* a very remarkable one.